

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:  
a channel layer of SiGe formed over a silicon substrate,  
the channel layer having a thickness of 2 to 6 nm;  
a gate electrode formed over the channel layer with a gate  
insulation film formed therebetween; and  
a source/drain diffused layer formed on both sides of the  
gate electrode.
2. A semiconductor device according to claim 1, wherein  
the channel layer has a gradient composition of germanium  
which is gradually decreased from a side of the silicon substrate  
to a side of the insulation film.
3. A semiconductor device according to claim 1, which  
further comprises  
a sidewall insulation film formed on the side wall of the  
gate electrode, and in which  
the channel layer is formed only just below the gate  
electrode and the sidewall insulation film.
4. A semiconductor device according to claim 1, wherein  
the channel layer is formed only just below the gate  
electrode.
5. A semiconductor device comprising:  
a buffer layer of SiGe formed over a silicon substrate;  
a channel layer of silicon formed over the buffer layer,  
the channel layer having a thickness of 2 to 6 nm;

a gate electrode formed over the channel layer with a gate insulation film formed therebetween; and

a source/drain diffused layer formed on both sides of the gate electrode.

6. A semiconductor device according to claim 1, further comprising

source/drain electrodes of nickel silicide formed on the source/drain diffused layer.

7. A semiconductor device according to claim 3, further comprising

source/drain electrodes of nickel silicide formed on the source/drain diffused layer.

8. A semiconductor device according to claim 4, further comprising

source/drain electrodes of nickel silicide formed on the source/drain diffused layer.

9. A semiconductor device according to claim 5, further comprising

source/drain electrodes of nickel silicide formed on the source/drain diffused layer.

10. A semiconductor device according to claim 3, further comprising

source/drain electrodes of cobalt silicide formed on the source/drain diffused layer.

11. A semiconductor device according to claim 4, further comprising

source/drain electrodes of cobalt silicide formed on the source/drain diffused layer.

12. A semiconductor device according to claim 5, further comprising

source/drain electrodes of cobalt silicide formed on the source/drain diffused layer.

13. A method for fabricating a semiconductor device comprising the steps of:

forming a channel layer of SiGe formed over a silicon substrate, the channel layer having a thickness of 2 to 6 nm;

forming a gate electrode over the channel layer with a gate insulation film formed therebetween;

implanting a dopant impurity into the silicon substrate with the gate electrode as a mask to form first impurity diffused regions on both sides of the gate electrode;

forming a sidewall insulation film on the side wall of the gate electrode; and

implanting a dopant impurity into the silicon substrate with the gate electrode and the sidewall insulation film as a mask to form second impurity diffused regions.

14. A method for fabricating a semiconductor device according to claim 13, wherein

the step of forming a sidewall insulation film includes the step of forming an insulation film over the silicon substrate, covering the gate electrode, and the step of anisotropically etching the insulation film to form the sidewall insulation film

of the insulation film on the side wall of the gate electrode,  
and

in the step of anisotropically etching the insulation film,  
the channel layer also in a region other than the region just  
below the gate electrode and the sidewall insulation film is  
etched off.

15. A method for fabricating a semiconductor device  
according to claim 13, wherein

the step of forming the gate electrode includes the step  
of forming a semiconductor film over the gate insulation film,  
the step of forming a mask over the semiconductor film, and the  
step of etching the semiconductor film using the mask to form  
the gate electrode of the semiconductor film, and

in the step of etching the semiconductor film, the channel  
layer also in a region other than the region just below the gate  
electrode is etched off.

16. A method for fabricating a semiconductor device  
according to claim 14, wherein

the metal silicide is cobalt silicide.

17. A method for fabricating a semiconductor device  
according to claim 15, wherein

the metal silicide is cobalt silicide.

18. A method for fabricating a semiconductor device  
comprising the steps of:

forming a buffer layer of SiGe over a silicon substrate;

forming a channel layer over the buffer layer, the channel

layer having a thickness of 2 to 6 nm;

forming a gate electrode over the channel layer with a gate insulation film formed therebetween:

implanting a dopant impurity into the channel layer and the buffer layer with the gate electrode as a mask to form first impurity diffused regions on both sides of the gate electrode;

forming a sidewall insulation film on the side wall of the gate electrode; and

implanting a dopant impurity into the channel layer and the buffer layer with the gate electrode and the sidewall insulation film as a mask to form second impurity diffused regions.